



Europäisches Patentamt
European Patent Office
Office européen des brevets



⑪ Publication number: 0 669 250 A1

⑫

EUROPEAN PATENT APPLICATION

㉑ Application number: 95102449.6

㉑ Int. Cl. 6: B62M 25/04, B62K 23/06

㉒ Date of filing: 21.02.95

㉓ Priority: 23.02.94 JP 25017/94

㉑ Applicant: SHIMANO INC.
77, Oimatsucho 3-cho
Sakai-shi
Osaka (JP)

㉔ Date of publication of application:
30.08.95 Bulletin 95/35

㉒ Inventor: Abe, Takeo
Minami Noda 335-1-425
Sakai-shi,
Osaka (JP)

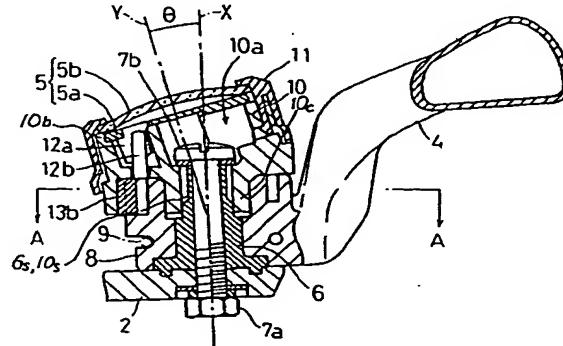
㉕ Designated Contracting States:
DE FR GB IT

㉔ Representative: Herrmann-Trentepohl,
Werner, Dipl.-Ing. et al
Patentanwälte Herrmann-Trentepohl,
Kirschner, Grosse, Bockhorni & Partner
Forstenrieder Allee 59
D-81476 München (DE)

㉖ Shifting apparatus for a bicycle.

㉗ A shifting apparatus for a bicycle includes a fixed shaft (6), a takeup element (8) rotatable about an axis (x) of the fixed shaft (6) to wind a control cable (9) thereon, a shift lever (4) for rotating the takeup element (8), and an indicator (5). The indicator (5) includes a rotatable member (5a) interlocked to the takeup element (8) to be rotatable about a rotational axis (y), and a fixed member (5b) for a speed stage of a change gear device based on a displacement relative to the rotatable member (5a). The rotational axis (y) of the rotatable member (5a) extends at an angle (θ) to the axis (x) of the fixed shaft (6). At least a portion of the indicator (5) is present on an extension of the axis (x) of the fixed shaft (6).

Fig. 2



EP 0 669 250 A1

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a shifting apparatus for shifting a front derailleur or rear derailleur of a bicycle. More particularly, the invention relates to an improvement in a shifting apparatus for a bicycle having an indicator for indicating speed stages of a derailleur.

DESCRIPTION OF THE RELATED ART

A conventional shifting apparatus of the type noted above is disclosed in Japanese Utility Model Publication Kokai No. 1990-68289, for example. As does the apparatus disclosed in this publication, many of the conventional shifting apparatus include a control cable takeup element rotatably mounted on a fixed shaft, and a speed indicator having a rotatable member also rotatably mounted on the fixed shaft. The rotatable member is rotatable with the takeup element to indicate speed stages of a derailleur.

U.S. Patent No. 5,325,735 discloses another example of shifting apparatus which is mounted adjacent a handlebar. This apparatus includes a lever pivotable about a rotational axis of a takeup element, and an indicator rotatable about an axis disposed at 90 degrees to the above rotational axis. The takeup element and indicator are interlocked through crown gears.

U.S. Patent No. 4,325,267 discloses a further example of shifting apparatus which is mounted on a handlebar. A lever usually is arranged pivotable about an axis extending perpendicular to the handlebar axis or a mounting plane of the shifting apparatus. In the apparatus disclosed in this patent, however, the lever is pivotable about an axis inclined with respect to the usual pivotal axis of the lever in order to allow a thumb and a finger of the cyclist's hand holding the handlebar to follow the lever with ease during a shifting operation.

In the first known example of shifting apparatus noted above, the takeup element and the rotatable member of the indicator are rotatably mounted on one fixed shaft, to realize a compact construction. However, when this shifting apparatus is attached to the handlebar with a shift lever disposed in a position easy to operate to rotate the takeup element, the operability of the lever is improved indeed but the indicator lies in a position difficult for the cyclist to see. There is room for improvement in this respect.

In the second known example noted above, the pivotal axis of the lever extends perpendicular to the rotational axis of the indicator. Thus, compared with the first example, the cyclist has a good view

5 of the indicator with the operability of the lever maintained when effecting a shifting operation. However, the indicator disposed at 90 degrees to the handlebar axis (or the mounting plane of the apparatus) has a surface always extending parallel to the handlebar axis (or the mounting plane of the apparatus). When the shifting apparatus is mounted so that the shift lever lies in an optimal position for the cyclist, the indicator does not necessarily lie in an optimal position to be viewed by the cyclist. There is room for improvement in this respect. Further, since the rotational axis of the indicator is disposed at 90 degrees to the handlebar axis, an interlock mechanism (e.g. meshing of crown gears as disclosed) is provided between the takeup element and indicator. This results in an increased number of components and a complicated construction. Thus, there is room for improvement from the points of view of cost and assembling trouble.

10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 1235 1240 1245 1250 1255 1260 1265 1270 1275 1280 1285 1290 1295 1300 1305 1310 1315 1320 1325 1330 1335 1340 1345 1350 1355 1360 1365 1370 1375 1380 1385 1390 1395 1400 1405 1410 1415 1420 1425 1430 1435 1440 1445 1450 1455 1460 1465 1470 1475 1480 1485 1490 1495 1500 1505 1510 1515 1520 1525 1530 1535 1540 1545 1550 1555 1560 1565 1570 1575 1580 1585 1590 1595 1600 1605 1610 1615 1620 1625 1630 1635 1640 1645 1650 1655 1660 1665 1670 1675 1680 1685 1690 1695 1700 1705 1710 1715 1720 1725 1730 1735 1740 1745 1750 1755 1760 1765 1770 1775 1780 1785 1790 1795 1800 1805 1810 1815 1820 1825 1830 1835 1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080 2085 2090 2095 2100 2105 2110 2115 2120 2125 2130 2135 2140 2145 2150 2155 2160 2165 2170 2175 2180 2185 2190 2195 2200 2205 2210 2215 2220 2225 2230 2235 2240 2245 2250 2255 2260 2265 2270 2275 2280 2285 2290 2295 2300 2305 2310 2315 2320 2325 2330 2335 2340 2345 2350 2355 2360 2365 2370 2375 2380 2385 2390 2395 2400 2405 2410 2415 2420 2425 2430 2435 2440 2445 2450 2455 2460 2465 2470 2475 2480 2485 2490 2495 2500 2505 2510 2515 2520 2525 2530 2535 2540 2545 2550 2555 2560 2565 2570 2575 2580 2585 2590 2595 2600 2605 2610 2615 2620 2625 2630 2635 2640 2645 2650 2655 2660 2665 2670 2675 2680 2685 2690 2695 2700 2705 2710 2715 2720 2725 2730 2735 2740 2745 2750 2755 2760 2765 2770 2775 2780 2785 2790 2795 2800 2805 2810 2815 2820 2825 2830 2835 2840 2845 2850 2855 2860 2865 2870 2875 2880 2885 2890 2895 2900 2905 2910 2915 2920 2925 2930 2935 2940 2945 2950 2955 2960 2965 2970 2975 2980 2985 2990 2995 3000 3005 3010 3015 3020 3025 3030 3035 3040 3045 3050 3055 3060 3065 3070 3075 3080 3085 3090 3095 3100 3105 3110 3115 3120 3125 3130 3135 3140 3145 3150 3155 3160 3165 3170 3175 3180 3185 3190 3195 3200 3205 3210 3215 3220 3225 3230 3235 3240 3245 3250 3255 3260 3265 3270 3275 3280 3285 3290 3295 3300 3305 3310 3315 3320 3325 3330 3335 3340 3345 3350 3355 3360 3365 3370 3375 3380 3385 3390 3395 3400 3405 3410 3415 3420 3425 3430 3435 3440 3445 3450 3455 3460 3465 3470 3475 3480 3485 3490 3495 3500 3505 3510 3515 3520 3525 3530 3535 3540 3545 3550 3555 3560 3565 3570 3575 3580 3585 3590 3595 3600 3605 3610 3615 3620 3625 3630 3635 3640 3645 3650 3655 3660 3665 3670 3675 3680 3685 3690 3695 3700 3705 3710 3715 3720 3725 3730 3735 3740 3745 3750 3755 3760 3765 3770 3775 3780 3785 3790 3795 3800 3805 3810 3815 3820 3825 3830 3835 3840 3845 3850 3855 3860 3865 3870 3875 3880 3885 3890 3895 3900 3905 3910 3915 3920 3925 3930 3935 3940 3945 3950 3955 3960 3965 3970 3975 3980 3985 3990 3995 4000 4005 4010 4015 4020 4025 4030 4035 4040 4045 4050 4055 4060 4065 4070 4075 4080 4085 4090 4095 4100 4105 4110 4115 4120 4125 4130 4135 4140 4145 4150 4155 4160 4165 4170 4175 4180 4185 4190 4195 4200 4205 4210 4215 4220 4225 4230 4235 4240 4245 4250 4255 4260 4265 4270 4275 4280 4285 4290 4295 4300 4305 4310 4315 4320 4325 4330 4335 4340 4345 4350 4355 4360 4365 4370 4375 4380 4385 4390 4395 4400 4405 4410 4415 4420 4425 4430 4435 4440 4445 4450 4455 4460 4465 4470 4475 4480 4485 4490 4495 4500 4505 4510 4515 4520 4525 4530 4535 4540 4545 4550 4555 4560 4565 4570 4575 4580 4585 4590 4595 4600 4605 4610 4615 4620 4625 4630 4635 4640 4645 4650 4655 4660 4665 4670 4675 4680 4685 4690 4695 4700 4705 4710 4715 4720 4725 4730 4735 4740 4745 4750 4755 4760 4765 4770 4775 4780 4785 4790 4795 4800 4805 4810 4815 4820 4825 4830 4835 4840 4845 4850 4855 4860 4865 4870 4875 4880 4885 4890 4895 4900 4905 4910 4915 4920 4925 4930 4935 4940 4945 4950 4955 4960 4965 4970 4975 4980 4985 4990 4995 5000 5005 5010 5015 5020 5025 5030 5035 5040 5045 5050 5055 5060 5065 5070 5075 5080 5085 5090 5095 5100 5105 5110 5115 5120 5125 5130 5135 5140 5145 5150 5155 5160 5165 5170 5175 5180 5185 5190 5195 5200 5205 5210 5215 5220 5225 5230 5235 5240 5245 5250 5255 5260 5265 5270 5275 5280 5285 5290 5295 5300 5305 5310 5315 5320 5325 5330 5335 5340 5345 5350 5355 5360 5365 5370 5375 5380 5385 5390 5395 5400 5405 5410 5415 5420 5425 5430 5435 5440 5445 5450 5455 5460 5465 5470 5475 5480 5485 5490 5495 5500 5505 5510 5515 5520 5525 5530 5535 5540 5545 5550 5555 5560 5565 5570 5575 5580 5585 5590 5595 5600 5605 5610 5615 5620 5625 5630 5635 5640 5645 5650 5655 5660 5665 5670 5675 5680 5685 5690 5695 5700 5705 5710 5715 5720 5725 5730 5735 5740 5745 5750 5755 5760 5765 5770 5775 5780 5785 5790 5795 5800 5805 5810 5815 5820 5825 5830 5835 5840 5845 5850 5855 5860 5865 5870 5875 5880 5885 5890 5895 5900 5905 5910 5915 5920 5925 5930 5935 5940 5945 5950 5955 5960 5965 5970 5975 5980 5985 5990 5995 6000 6005 6010 6015 6020 6025 6030 6035 6040 6045 6050 6055 6060 6065 6070 6075 6080 6085 6090 6095 6100 6105 6110 6115 6120 6125 6130 6135 6140 6145 6150 6155 6160 6165 6170 6175 6180 6185 6190 6195 6200 6205 6210 6215 6220 6225 6230 6235 6240 6245 6250 6255 6260 6265 6270 6275 6280 6285 6290 6295 6300 6305 6310 6315 6320 6325 6330 6335 6340 6345 6350 6355 6360 6365 6370 6375 6380 6385 6390 6395 6400 6405 6410 6415 6420 6425 6430 6435 6440 6445 6450 6455 6460 6465 6470 6475 6480 6485 6490 6495 6500 6505 6510 6515 6520 6525 6530 6535 6540 6545 6550 6555 6560 6565 6570 6575 6580 6585 6590 6595 6600 6605 6610 6615 6620 6625 6630 6635 6640 6645 6650 6655 6660 6665 6670 6675 6680 6685 6690 6695 6700 6705 6710 6715 6720 6725 6730 6735 6740 6745 6750 6755 6760 6765 6770 6775 6780 6785 6790 6795 6800 6805 6810 6815 6820 6825 6830 6835 6840 6845 6850 6855 6860 6865 6870 6875 6880 6885 6890 6895 6900 6905 6910 6915 6920 6925 6930 6935 6940 6945 6950 6955 6960 6965 6970 6975 6980 6985 6990 6995 7000 7005 7010 7015 7020 7025 7030 7035 7040 7045 7050 7055 7060 7065 7070 7075 7080 7085 7090 7095 7100 7105 7110 7115 7120 7125 7130 7135 7140 7145 7150 7155 7160 7165 7170 7175 7180 7185 7190 7195 7200 7205 7210 7215 7220 7225 7230 7235 7240 7245 7250 7255 7260 7265 7270 7275 7280 7285 7290 7295 7300 7305 7310 7315 7320 7325 7330 7335 7340 7345 7350 7355 7360 7365 7370 7375 7380 7385 7390 7395 7400 7405 7410 7415 7420 7425 7430 7435 7440 7445 7450 7455 7460 7465 7470 7475 7480 7485 7490 7495 7500 7505 7510 7515 7520 7525 7530 7535 7540 7545 7550 7555 7560 7565 7570 7575 7580 7585 7590 7595 7600 7605 7610 7615 7620 7625 7630 7635 7640 7645 7650 7655 7660 7665 7670 7675 7680 7685 7690 7695 7700 7705 7710 7715 7720 7725 7730 7735 7740 7745 7750 7755 7760 7765 7770 7775 7780 7785 7790 7795 7800 7805 7810 7815 7820 7825 7830 7835 7840 7845 7850 7855 7860 7865 7870 7875 7880 7885 7890 7895 7900 7905 7910 7915 7920 7925 7930 7935 7940 7945 7950 7955 7960 7965 7970 7975 7980 7985 7990 7995 8000 8005 8010 8015 8020 8025 8030 8035 8040 8045 8050 8055 8060 8065 8070 8075 8080 8085 8090 8095 8100 8105 8110 8115 8120 8125 8130 8135 8140 8145 8150 8155 8160 8165 8170 8175 8180 8185 8190 8195 8200 8205 8210 8215 8220 8225 8230 8235 8240 8245 8250 8255 8260 8265 8270 8275 8280 8285 8290 8295 8300 8305 8310 8315 8320 8325 8330 8335 8340 8345 8350 8355 8360 8365 8370 8375 8380 8385 8390 8395 8400 8405 8410 8415 8420 8425 8430 8435 8440 8445 8450 8455 8460 8465 8470 8475 8480 8485 8490 8495 8500 8505 8510 8515 8520 8525 8530 8535 8540 8545 8550 8555 8560 8565 8570 8575 8580 8585 8590 8595 8600 8605 8610 8615 8620 8625 8630 8635 8640 8645 8650 8655 8660 8665 8670 8675 8680 8685 8690 8695 8700 8705 8710 8715 8720 8725 8730 8735 8740 8745 8750 8755 8760 8765 8770 8775 8780 8785 8790 8795 8800 8805 8810 8815 8820 8825 8830 8835 8840 8845 8850 8855 8860 8865 8870 8875 8880 8885 8890 8895 8900 8905 8910 8915 8920 8925 8930 8935 8940 8945 8950 8955 8960 8965 8970 8975 8980 8985 8990 8995 9000 9005 9010 9015 9020 9025 9030 9035 9040 9045 9050 9055 9060 9065 9070 9075 9080 9085 9090 9095 9100 9105 9110 9115 9120 9125 9130 9135 9140 9145 9150 9155 9160 9165 9170 9175 9180 9185 9190 9195 9200 9205 9210 9215 9220 9225 9230 9235 9240 9245 9250 9255 9260 9265 9270 9275 9280 9285 9290 9295 9300 9305 9310 9315 9320 9325 9330 9335 9340 9345 9350 9355 9360 9365 9370 9375 9380 9385 9390 9395 9400 9405 9410 9415 9420 9425 9430 9435 9440 9445 9450 9455 9460 9465 9470 9475 9480 9485 9490 9495 9500 9505 9510 9515 9520 9525 9530 9535 9540 9545 9550 9555 9560 9565 9570 9575 9580 9585 9590 9595 9600 9605 9610 9615 9620 9625 9630 9635 9640 9645 9650 9655 9660 9665 9670 9675 9680 9685 9690 9695 9700 9705 9710 9715 9720 9725 9730 9735 9740 9745 9750 9755 9760 9765 9770 9775 9780 9785 9790 9795 9800 9805 9810 9815 9820 9825 9830 9835 9840 9845 9850 9855 9860 9865 9870 9875 9880 9885 9890 9895 9900 9905 9910 9915 9920 9925 9930 9935 9940 9945 9950 9955 9960 9965 9970 9975 9980 9985 9990 9995 9999

member for a speed stage of a change gear device based on a displacement relative to the rotatable member, wherein the rotational axis of the rotatable member extends at an angle to the axis of the fixed shaft, at least a portion of the indicator being present on an extension of the axis of the fixed shaft.

In the shifting apparatus for a bicycle according to the present invention, the axis of the shift lever and takeup element and the axis of the rotatable member of the indicator extend at an angle to each other. With this construction, an angle and direction of inclination between the two axes may be optimized while maintaining operability of the shift lever. This sets the indicator to an optimal angular position to present a display plane for view by the cyclist.

The above angle of inclination is set within a range to maintain at least a portion of the rotatable member of the indicator on an extension of the rotational axis of the takeup element rotatable by the shift lever. The present invention, therefore, does not require a complicated interlock mechanism between the takeup element and the rotatable member of the indicator, as required in the second known example noted above.

Thus, the shifting apparatus according to the present invention has a compact overall construction, and yet allows the shift lever to be disposed in a position easy to operate, and the indicator to face in a direction easy to see.

Other features and advantages of the present invention will be apparent from the following description of the preferred embodiments taken with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of a first embodiment of the present invention;

Fig. 2 is a view in vertical section of the first embodiment;

Fig. 3 is a section taken on line A-A of Fig. 2;

Fig. 4 is a view in vertical section of a second embodiment;

Fig. 5 is a section taken on line B-B of Fig. 4; and

Fig. 6 is an exploded perspective view of a principal portion of the second embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first embodiment of the present invention will be described with reference to the drawings. Fig. 1 is a plan view showing a right brake lever 1 attached to a brake lever bracket 2 mounted on a handlebar 3. The brake lever bracket 2 supports a

shifting apparatus including a shift lever 4 and an indicator 5.

As shown in Fig. 2, a fixed shaft (or fixed shaft means) 6 defining a female screw centrally thereof is mounted on an upper surface of the brake lever bracket 2. The fixed shaft (or fixed shaft means) 6 is fixed to the bracket 2 by a bolt 7a, with an axis X of the fixed shaft 6 extending substantially perpendicular to the upper surface of the bracket 2. The fixed shaft 6 supports a takeup element 8 rotatably mounted on a lower portion thereof. The takeup element 8 is formed of the same material as and integral with a proximal end of the shift lever 4. The shift lever 4 is operable to rotate the takeup element 8 to wind or unwind a control cable 9 secured to the takeup element 8, thereby shifting a derailleur not shown.

The fixed shaft 6 supports a fixed frame (or fixed frame member) 10 mounted on an upper portion thereof ad having a circular window 10a. The fixed frame 10 includes a boss 10c extending downward. The boss 10c defines inner splines 10s engaged with outer splines 6s formed on the fixed shaft 6. These splines 6s and 10s act as a first ad a second engaging members of an engaging device. Thus, the fixed frame 10 is mounted on the fixed shaft 6 not to be rotatable relative thereto through the splines 6s and 10s, and fixed to the fixed shaft 6 by a bolt 7b.

The fixed frame 10 further includes an arc-shaped bulge 10d formed on a lower portion thereof and defining recesses 13c of a positioning mechanism described later.

The indicator 5 includes a rotatable member 5a mounted in the window 10a of the fixed frame 10. The rotatable member 5a is rotatable relative to the fixed frame 10, with a circular outer edge of the rotatable member 5a slidably fitted in a circular recess 10b defined in an inlet portion of the window 10a of the fixed frame 10. The indicator 5 further includes a fixed member 5b disposed above the rotatable member 5a and removably attached to the fixed frame 10 by a mounting cap 11.

As seen from Fig. 2, the circular window 10a has a centerline thereof slightly inclined with respect to a proximal portion of the fixed frame 10 splined to the fixed shaft 6. That is, the rotatable member 5a and fixed member 5b of the indicator 5 are mounted in the window 10a, such that the rotatable member 5a is disposed above ad opposed to an end of the fixed shaft 6, and that the rotatable member 5a and fixed member 5b have a common axis Y inclined by an angle q with respect to the axis X of the fixed shaft 6. As also seen from Fig. 2, the angle of inclination q is not a large angle close to 90 degrees, but is such an angle that at least a portion of the indicator 5 lies on an extension of the axis X of the fixed shaft 6.

When the brake lever bracket 2 is attached to the handlebar 3, as seen from the plan view in Fig. 1, the rotatable member 5a and fixed member 5b of the indicator 5 are not inclined not only downward in Fig. 1 with respect to a mounting plane of the brake lever bracket 2, but also leftward in Fig. 1. The indicator 5 is inclined leftward since this bracket 2 is designed for a right brake lever. The indicator 5 is inclined rightward in the case of a bracket designed for a left brake lever. In other words, the indicator 5 is inclined toward the eyes of the cyclist riding the bicycle.

The angle of inclination q should be determined, taking account of a position and posture relative to the entire bicycle of the bracket or handlebar on which the shifting apparatus is mounted, and its size and direction may vary from bicycle to bicycle. This angle of inclination is up to about 30 degrees where the shifting apparatus is mounted on a brake lever bracket for use on a bicycle having an ordinary horizontal handlebar.

The fixed member 5b of the indicator 5 is formed of a transparent plate, and has speed marks A printed or stamped thereon which correspond in number to speed stages provided by the derailleur. On the other hand, the rotatable member 5a of the indicator 5 has a pointer B provided thereon to enable, based on a position of the pointer B resulting from a rotation of the rotatable member 5a, a visual observation of a speed stage provided by the derailleur. The rotatable member 5a has engageable members 12a in the form of two plates integral with and extending from a lower surface of the rotatable member 5a. The takeup element 8 has an engaging pin 12b integral with and extending from an upper surface thereof. The engaging pin 12b is interposed between the two engageable members 12a. When the takeup element 8 is rotated about the axis X, the engagement between the engaging pin 12b and engageable members 12a causes the rotatable member 5a to rotate about the axis Y though the axis Y is inclined with respect to the axis X of the takeup element 8, thereby enabling a visual observation of a speed stage provided by the derailleur.

Alternatively, the engaging pin 12b may be formed integral with the rotatable member 5a of the indicator 5, and the engageable members 12a formed integral with the takeup element 8.

As seen from Figs. 2 and 3, the takeup element 8 has an outer periphery partly cut out as at 8a, and an elastically deformable positioning member 13b having a projection 13a is mounted in the cutout 8a. The arc-shaped bulge 10d of the fixed frame 10 opposed to the positioning member 13b defines recesses 13c corresponding in number to the speed stages of the derailleur for receiving the projection 13a. The projection 13a and recesses

13c constitute a positioning mechanism 13 provided between the takeup element 8 and fixed frame 10. When the takeup element 8 is rotated to effect a shifting operation, the projection 13a moves round with the rotation of the takeup element 8. At this time, the projection is elastically deformed to enter one of the recesses 13c to elastically retain the takeup element 8 in an angular position.

Operation of the first embodiment will be described next. When the shift lever 4 is swung in a direction U, the positioning member 13b of the positioning mechanism 13 rotates with the takeup element 8. The projection 13a moves out of one of the recesses 13c, and the takeup element 8 rotates in a winding direction from a previous angular position to wind the control cable 9 thereon. When the shift lever 4 reaches a selected shift position, the projection 13a moves into one of the recesses 13c corresponding to the selected shift position, whereby the positioning mechanism 13 retains the takeup element 8 in a new angular position.

Conversely, when the shift lever 4 is swung in a direction D, the projection 13a of the positioning mechanism 13 moves out of one of the recesses 13c as above, and the takeup element 8 rotates in an unwinding direction from a previous angular position. The control cable 9 is unwound from the takeup element 8 under the force of a return spring provided for the derailleur. When the shift lever 4 reaches a selected shift position, the projection 13a moves into a different recess 13c, whereby the positioning mechanism 13 retains the takeup element 8 in a new angular position.

Shifting operations are carried out as described above. Since the common axis Y of the rotatable member 5a and fixed member 5b of the indicator 5 is inclined by angle q with respect to the axis X of rotation of the takeup element 8, the speed stages indicated by the indicator 5 are easy to see while the shift lever 4 is readily operable to effect the shifting operations. The conventional shifting apparatus have the inconvenience that the indicator 5 inevitably faces in a direction difficult for the cyclist to see if the shift lever 4 is disposed in an optimal position. However, in the shifting apparatus according to the present invention, the indicator 5 may be oriented in a direction to facilitate its view by the cyclist while the shift lever 4 is attached to a position easy to operate, which is achieved by appropriately selecting the size and direction of inclination q of the axis Y.

A second embodiment of the present invention will be described next. In the following description, like reference numerals are used to identify like parts in the first embodiment and will not be described again, wherever possible, to avoid repetition.

As seen from Fig. 4, in the second embodiment also, a fixed shaft (or fixed shaft means) 6 is disposed on an upper surface of a brake lever bracket 2, and fixed to the bracket 2 by a bolt 7a, with the axis X of the fixed shaft 6 extending substantially perpendicular to the upper surface of the bracket 2. As in the first embodiment, a takeup element 8 is rotatably mounted in the fixed shaft 6. However, this takeup element 8 is mounted on an upper portion of the fixed shaft 6. The fixed shaft 6 further supports two shift levers 4a and 4b, as distinct from the first embodiment, which are pivotably attached thereto between the takeup element 8 and bracket 2. The first shift lever 4a is interlocked to the takeup element 8 through a first ratchet mechanism 14 having a first feed pawl 14a. The second shift lever 4b is interlocked to the takeup element 8 through a second ratchet mechanism 15 having a second feed pawl 15a.

The two shift levers 4a and 4b are pivotably mounted on the fixed shaft 6 through bushes 16a and 16b, and biased in opposite directions by return springs 17a and 17b, respectively. A cam 18 is fixed to the fixed shaft 6 between the shift levers 4a, 4b and the takeup element 8. As shown in Fig. 5, a first stopper 18a and a second stopper 18b extend from the cam 18. The first shift lever 4a pivots under the biasing force of the return spring 17a into contact with the first stopper 18a to be retained in original position N1. The second shift lever 4b pivots under the biasing force of the return spring 17b into contact with the second stopper 18b to be retained in original position N2.

As shown in Fig. 5, the takeup element 8 has a pair of ratchets 14b and 15b formed peripherally thereof and in opposite regions across the axis X of the fixed shaft 6. The first ratchet mechanism 14 consists of the first ratchet 14b and the first feed pawl 14a pivotably attached to a first pawl axis 14c extending from the first shift lever 4a. Similarly, the second ratchet mechanism 15 consists of the second ratchet 15b and the second feed pawl 15a pivotably attached to a second pawl axis 15c extending from the second shift lever 4b.

When the first shift lever 4a is in the original position N1, a tip end of the first feed pawl 14a of the first ratchet mechanism 14 rides on a first cam portion 18c of the cam 18. The first feed pawl 14a is pushed outward by the first cam portion 18c to be disengaged from the first ratchet 14b, to enable the second shift lever 4b to rotate the takeup element 8. When the first shift lever 4a is swung in a direction U from the original position N1, the first feed pawl 14a departs from the first cam portion 18c, and pivots toward the first ratchet 14b under the biasing force of a first pawl spring 14d. As a result, the first feed pawl 14a engages one of ratchet teeth of the first ratchet 14b, thereby inter-

locking the first shift lever 4a and takeup element 8 to be movable together. When the first shift lever 4a is swung from a certain shift position to the original position N1, the first feed pawl 14a is automatically disengaged from the first ratchet 14b by pushing action due to a configuration of the ratchet teeth.

In sum, when the first shift lever 4a pivots from the original position N1 to a shift position, the first ratchet mechanism 14, through the engagement between the first feed pawl 14a and first ratchet 14b, transmits the torque to the takeup element 8 to enable winding of the control cable 9. When the first shift lever 4a pivots from a shift position to the original position N1, the first feed pawl 14a is disengaged from the first ratchet 14b. The first shift lever 4a alone automatically returns to the original position N1 by the action of the return spring 17a, leaving the takeup element 8 in a selected angular position.

Similarly, when the second shift lever 4b is in the original position N2, a tip end of the second feed pawl 15a of the second ratchet mechanism 15 rides on a second cam portion 18d of the cam 18. The second feed pawl 15a is pushed outward by the second cam portion 18d to be disengaged from the second ratchet 15b, to enable the first shift lever 4a to rotate the takeup element 8. When the second shift lever 4b is swung in a direction D from the original position N2, the second feed pawl 15a departs from the second cam portion 18d, and pivots toward the second ratchet 15b under the biasing force of a second pawl spring 15d. As a result, the second feed pawl 15a engages one of ratchet teeth of the second ratchet 15b, thereby interlocking the second shift lever 4b and takeup element 8 to be movable together. When the second shift lever 4b is swung from a certain shift position to the original position N2, the second feed pawl 15a is automatically disengaged from the second ratchet 15b by pushing action due to a configuration of the ratchet teeth.

In sum, when the second shift lever 4b pivots from the original position N2 to a shift position, the second ratchet mechanism 15, through the engagement between the second feed pawl 15a and second ratchet 15b, transmits the torque to the takeup element 8 to enable unwinding of the control cable 9. When the second shift lever 4b pivots from a shift position to the original position N2, the second feed pawl 15a is disengaged from the second ratchet 15b. The second shift lever 4b alone automatically returns to the original position N2 by the action of the return spring 17b, leaving the takeup element 8 in a selected angular position.

As in the first embodiment, the fixed shaft 6 supports a fixed frame 10 fixed to an upper portion thereof by a bolt 7b and having a circular window

10a. A rotatable member 5a forming part of an indicator 5 is relatively rotatably mounted in the window 10a of the fixed frame 10. The indicator 5 further includes a fixed member 5b disposed above the rotatable member 5a and removably attached to the fixed frame 10 by a cap 11. As in the first embodiment, the rotatable member 5a and fixed member 5b of the indicator 5 are mounted in the window 10a, such that the rotatable member 5a and fixed member 5b arranged above the fixed shaft 6 and on the axis X of the fixed shaft 6 to have a common axis Y inclined by an angle α with respect to the axis X of the fixed shaft 6.

As in the first embodiment, the fixed member 5b of the indicator 5 is formed of a transparent plate having speed marks A. The rotatable member 5a has a pointer B. The rotatable member 5a has engageable members 12a, while the takeup element 8 has an engaging pin 12b. When the takeup element 8 is rotated about the axis X, the engagement between the engaging pin 12b and engageable members 12a causes the rotatable member 5a to rotate about the axis Y, thereby enabling a visual observation of a speed stage provided by the derailleur.

The takeup element 8 is hollowed out to define a mounting recess 19 therein, and a positioning mechanism 20 is disposed therein. The positioning mechanism 20 includes a pair of positioning plates 21 and 22 mounted on the fixed shaft 6, and a pair of belleville springs 23 mounted on the fixed shaft 6 between the positioning plate 21 and takeup element 8.

As shown in Fig. 6, one of the positioning plates 21 includes a circular mounting bore 21a defined centrally thereof, and spline projections 21b arranged peripherally. The positioning plate 21 is mounted on the fixed shaft 6 to be rotatable as well as slidable along the axis X thereof, with the spline projections 21b in spline engagement with the recess 19 of the takeup element 8 only to be rotatable therewith. Thus, the positioning plate 21 is slidable along the axis X relative to both the fixed shaft 6 and takeup element 8. When the takeup element 8 rotates, the positioning plate 21 rotates with the takeup element 8.

The other positioning plate 22 is mounted on the fixed shaft 6 in spline engagement therewith through a splined bore 22a, and supported in place by a clamp nut 24 through a spacer 25. Thus, the positioning plate 22 is neither rotatable nor slidable relative to the fixed shaft 6.

The belleville springs 23 biases one positioning plate 21 to slide toward the other positioning plate 22. As clearly shown in Fig. 6, the positioning plate 21 define a plurality of ridges 21c engageable with a plurality of grooves 22b formed in the positioning plate 22. When the positioning plate 21 engages

5 the positioning plate 22, the positioning plate 22, through the positioning plate 21, locks the takeup element 8 against rotation to retain the latter in a selected position. When the takeup element 8 is rotated by a force exceeding a predetermined force provided by the belleville springs 23, the positioning plate 21 slides away from the positioning plate 22 against the biasing force of the belleville springs 23. Consequently, the ridges 21c of the positioning plate 21 become disengaged from the grooves 22b of the positioning plate 22 to allow rotation of the takeup element 8.

10 In sum, this positioning mechanism 20 allows the takeup element 8 to be rotated by a force exceeding a predetermined value. When the positioning plate 21 engages the other positioning plate 22, the positioning mechanism 20 retains the takeup element 8 in a selected angular position against the force of the return spring of the derailleur applied through the control cable 9.

15 Operation of the second embodiment will be described next. When the first shift lever 4a is swung in the direction U from the original position N1, the shift lever 4a causes rotation of the takeup element 8 through the first ratchet mechanism 14. At the same time, the positioning mechanism 20 is canceled. As a result, the takeup element 8 rotates in a winding direction from a previous angular position to wind the control cable 9 thereon. When the first shift lever 4a is released after reaching a selected shift position, the positioning plate 21 is switched from disengaged state to engaged state whereby the positioning mechanism 20 retains the takeup element 8 in a new angular position. The first shift lever 4a automatically returns to the original position N1 under the force of return spring 17a.

20 When the second shift lever 4b is swung in the direction D from the original position N2, the shift lever 4b causes rotation of the takeup element 8 through the second ratchet mechanism 15. At the same time, the positioning mechanism 20 is canceled. As a result, the takeup element 8 rotates in an unwinding direction from a previous angular position to unwind the control cable 9 therefrom. When the second shift lever 4b is released after reaching a selected shift position, the positioning plate 21 is switched from disengaged state to engaged state whereby the positioning mechanism 20 retains the takeup element 8 in a new angular position. The second shift lever 4b automatically returns to the original position N2 under the force of return spring 17b.

25 In the second embodiment also, the common axis Y of the rotatable member 5a and fixed member 5b of the indicator 5 is inclined by angle α with respect to the axis X of rotation of the takeup element 8. Thus, as in the first embodiment, the

speed stages indicated by the indicator 5 are easy to see while the first and second shift levers 4a and 4b are readily operable to effect the shifting operations.

In the foregoing embodiments, the shifting apparatus is attached to the handlebar 3 through the brake lever bracket 2. However, the shifting apparatus may be attached directly to the handlebar 3.

Further, the rotatable member 5a of the indicator 5 has the pointer B, while the fixed member 5b has the speed marks A. Conversely, the rotatable member 5a may have the speed marks A, and the fixed member 5b the pointer B.

The first embodiment includes the positioning mechanism 13, and the second embodiment the positioning mechanism 20, for retaining the takeup element 8 in selected angular positions. These positioning mechanisms may be replaced by a construction including balls, springs for biasing the balls, and recesses for receiving the balls, attached to or formed in appropriate components.

Claims

1. A shifting apparatus for a bicycle comprising:
fixed shaft means;
a takeup element rotatable about an axis of said fixed shaft means to wind a control cable thereon;
shift lever means for rotating said takeup element; and
an indicator including a rotatable member interlocked to said takeup element to be rotatable about a rotational axis, and a fixed member for a speed stage of a change gear device based on a displacement relative to said rotatable member,
characterized in that said rotational axis extends at an angle to said axis,
and that at least a portion of said indicator is present on an extension of said axis.
2. A shifting apparatus as defined in claim 1, characterized in that said apparatus further comprises fixed frame means for supporting said indicator, said fixed frame means being relatively unrotatably mounted on said fixed shaft means through meshing means, and an index mechanism for retaining said takeup element in an angular position set by said shift lever means.
3. A shifting apparatus as defined in claim 2, characterized in that said apparatus further comprises connecting means for operatively interconnecting said takeup element and said rotatable member, said connecting means including an engaging member provided on said

takeup element, and an engageable member provided on said rotatable member.

4. A shifting apparatus as defined in claim 3, characterized in that said engaging member is a pin-shaped member formed on said takeup element, and said engageable member is a pair of projections formed integral with said rotatable member and opposed to each other with said pin-shaped member disposed in between.
5. A shifting apparatus as defined in claim 3, characterized in that said engageable member is a pin-shaped member formed on said takeup element, and said engaging member is a pair of projections formed on said rotatable member and opposed to each other with said pin-shaped member disposed in between.
6. A shifting apparatus as defined in claim 2, characterized in that said meshing means includes a first meshing member formed in a boss extending from one end of said fixed frame means, and a second meshing member formed on an end portion of said fixed shaft means and engaged with said first meshing member.
7. A shifting apparatus as defined in claim 6, characterized in that said takeup element has a recess formed in an end portion thereof for slidably receiving an outer periphery of said boss.
8. A shifting apparatus as defined in claim 6, characterized in that said first meshing member is inner splines formed in an inner peripheral surface of said boss, and said second meshing member is outer splines formed on said end portion.
9. A shifting apparatus as defined in claim 7, characterized in that said one end of said fixed frame means has an arcuate section, with a projection formed on said one end to form part of said index mechanism.
10. A shifting apparatus as defined in claim 1, characterized in that said shift lever means is formed integral with said takeup element.

Fig. 1

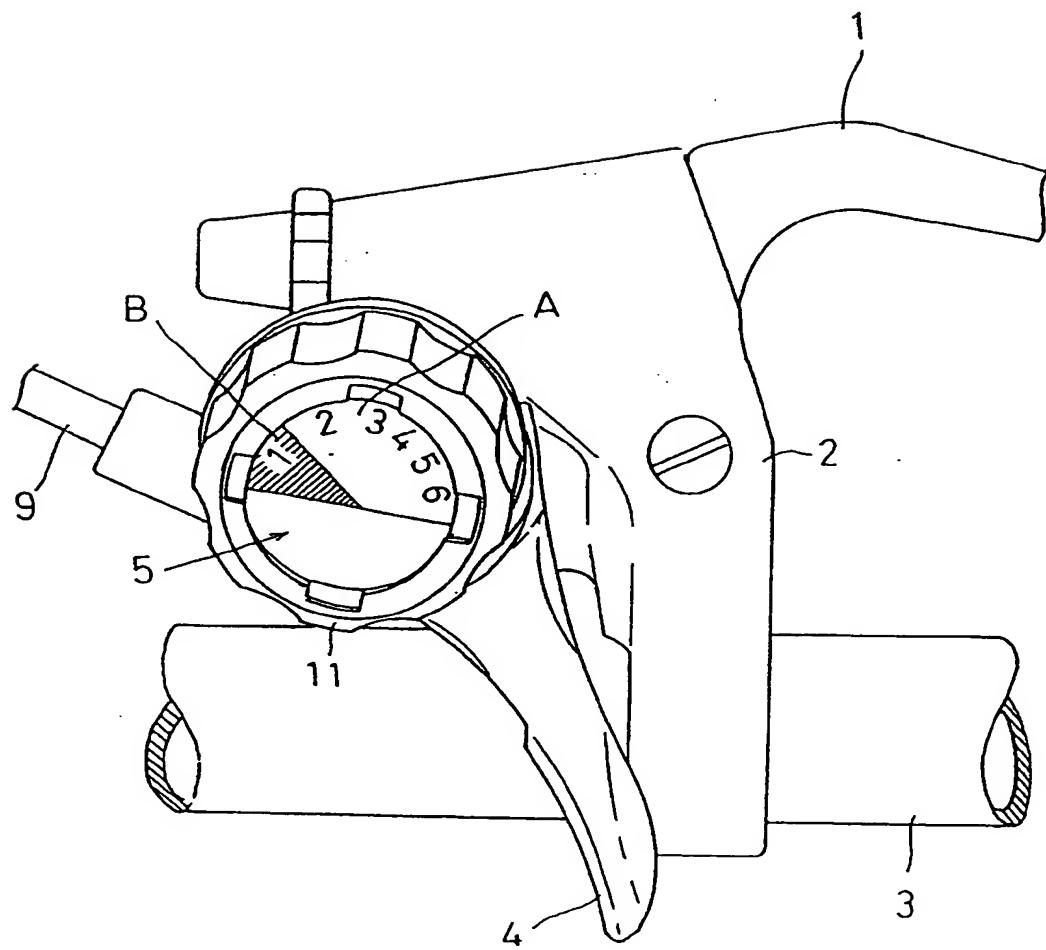


Fig. 2

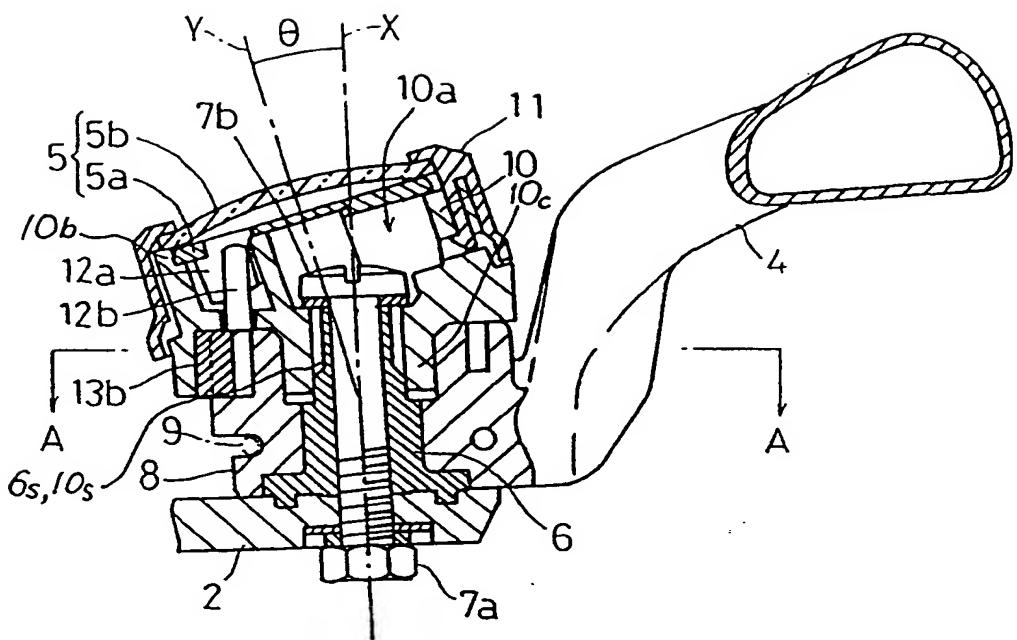


Fig. 3

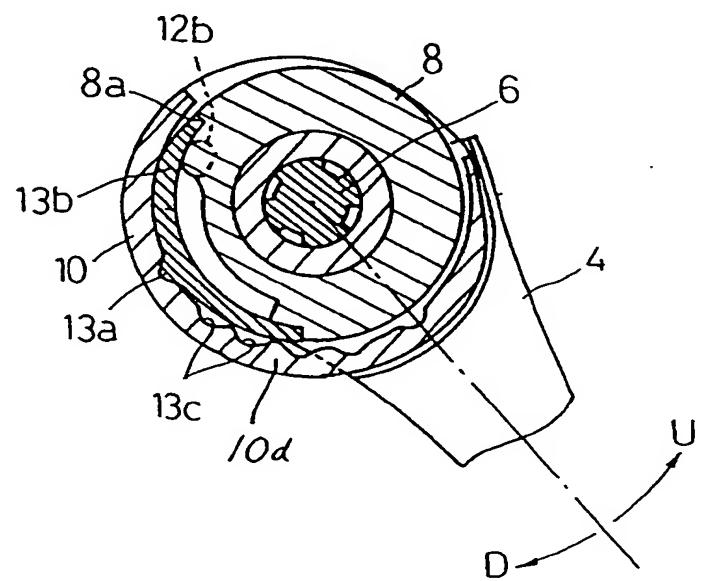


Fig. 4

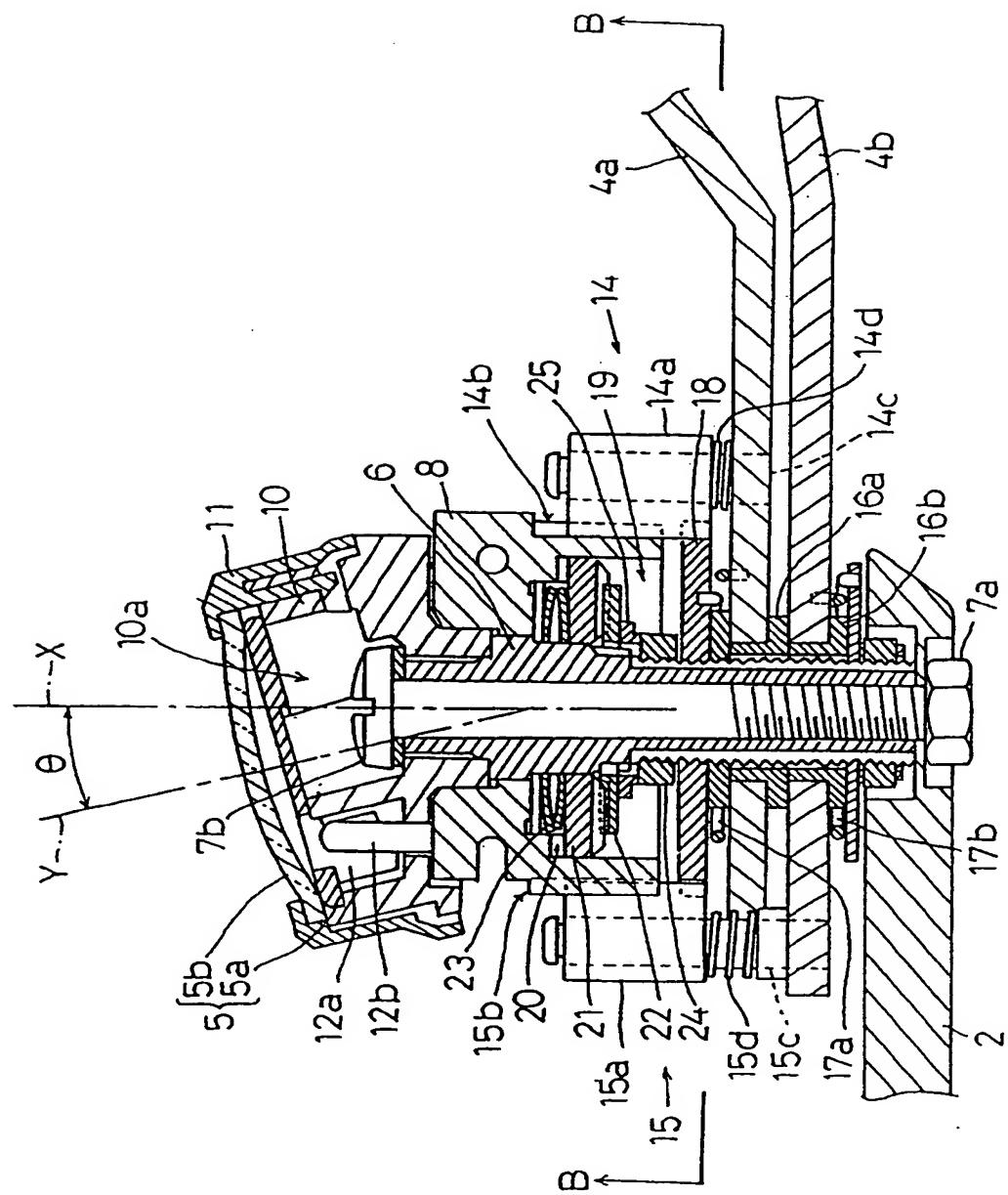


Fig. 5

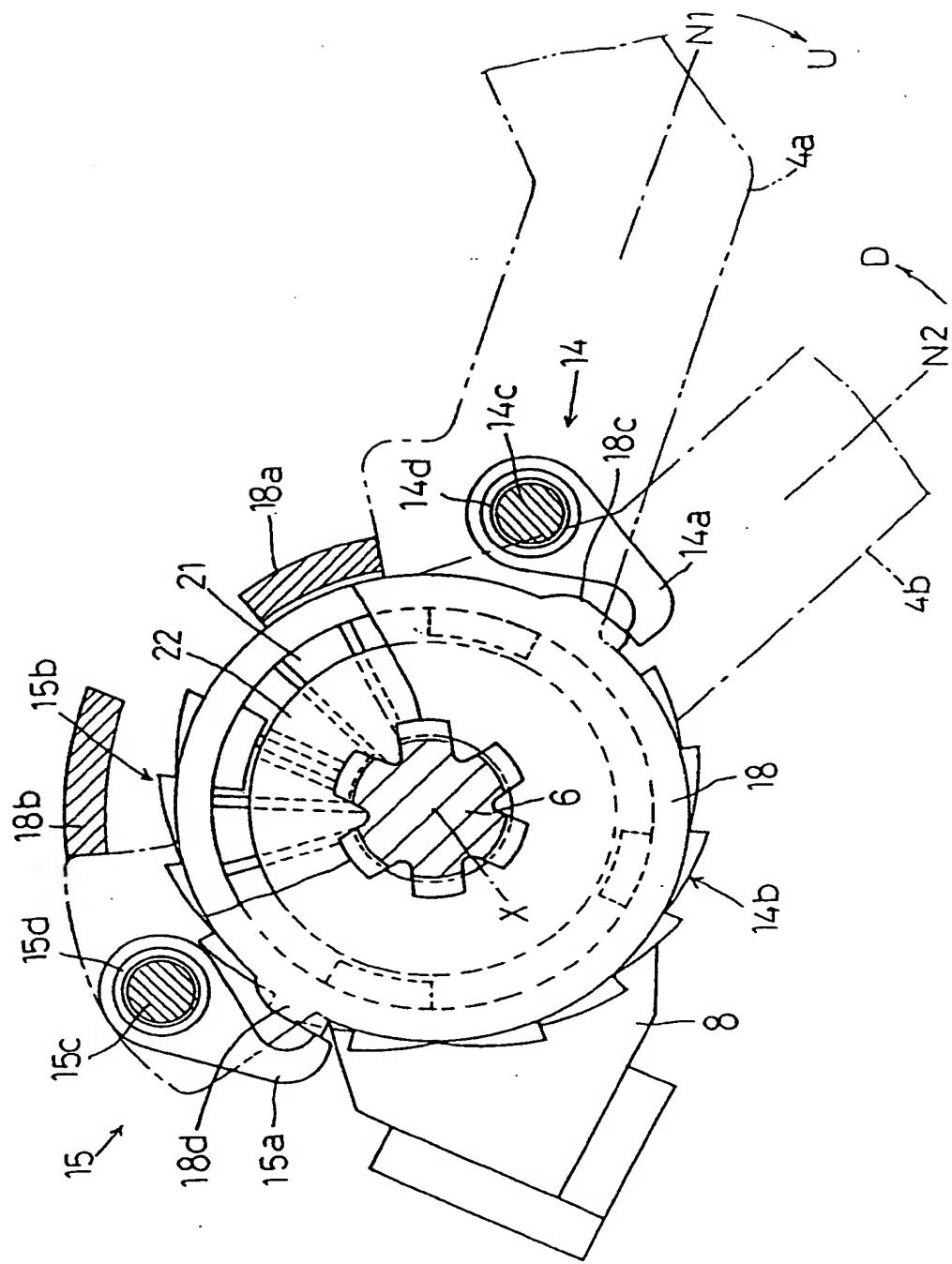
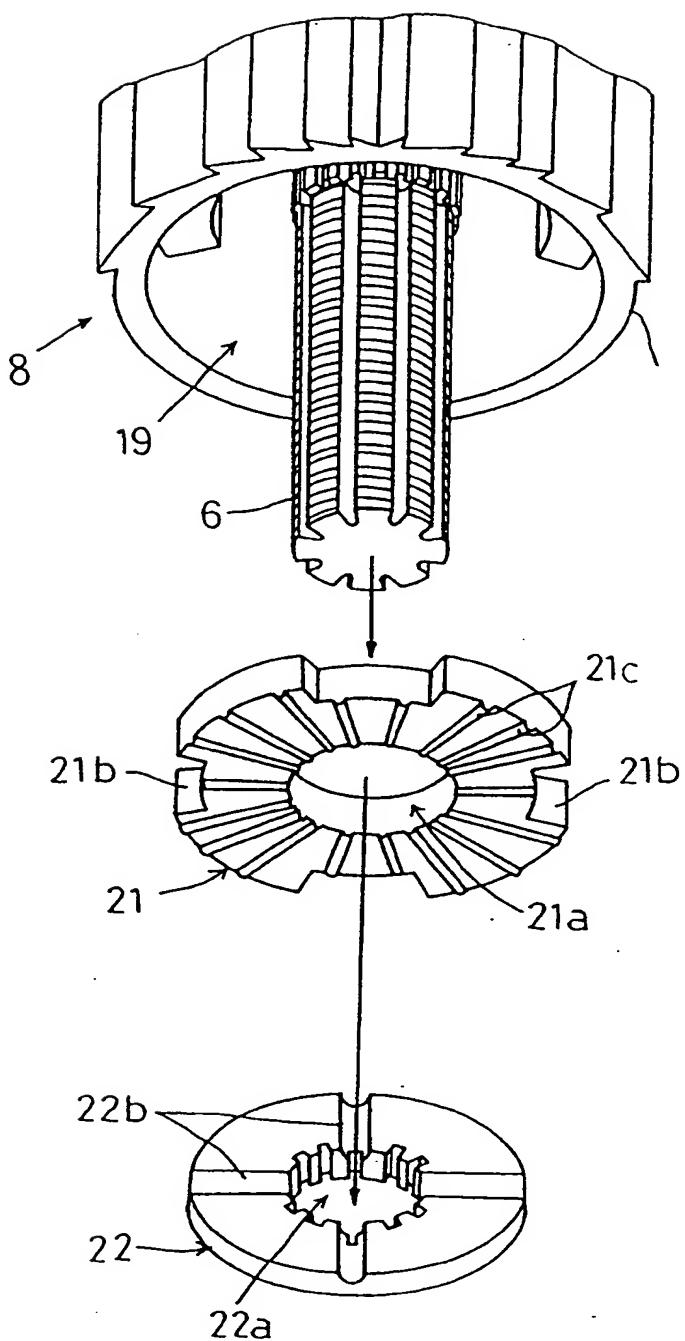


Fig. 6





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 2449

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.)
Y,D	US-A-4 325 267 (KOJIMA) * column 3, line 6 - line 35; claim 1; figures 1,2 *	1-5, 10	B62M25/04 B62K23/06
Y,A	EP-A-0 552 775 (SHIMANO INC.) * column 6, line 33 - column 7, line 11; claim 1; figures *	1-5, 10 6-9	
Y,D, P	& US-A-5 325 735 (NAGANO) ---	1-5, 10	
A	US-A-3 524 979 (COHEN) * column 3, line 58 - column 4, line 14; figures 1,3,4 *	1	
A,D	JP-U-02 068 289 (MAEDA K.K.) * figures *	1	

			TECHNICAL FIELDS SEARCHED (Int.Cl.)
			B62M B62K
<p>The present search report has been drawn up for all claims</p>			
Place of search THE HAGUE	Date of compilation of the search 7 June 1995	Examiner Grunfeld, M	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- A : member of the same patent family, corresponding document	